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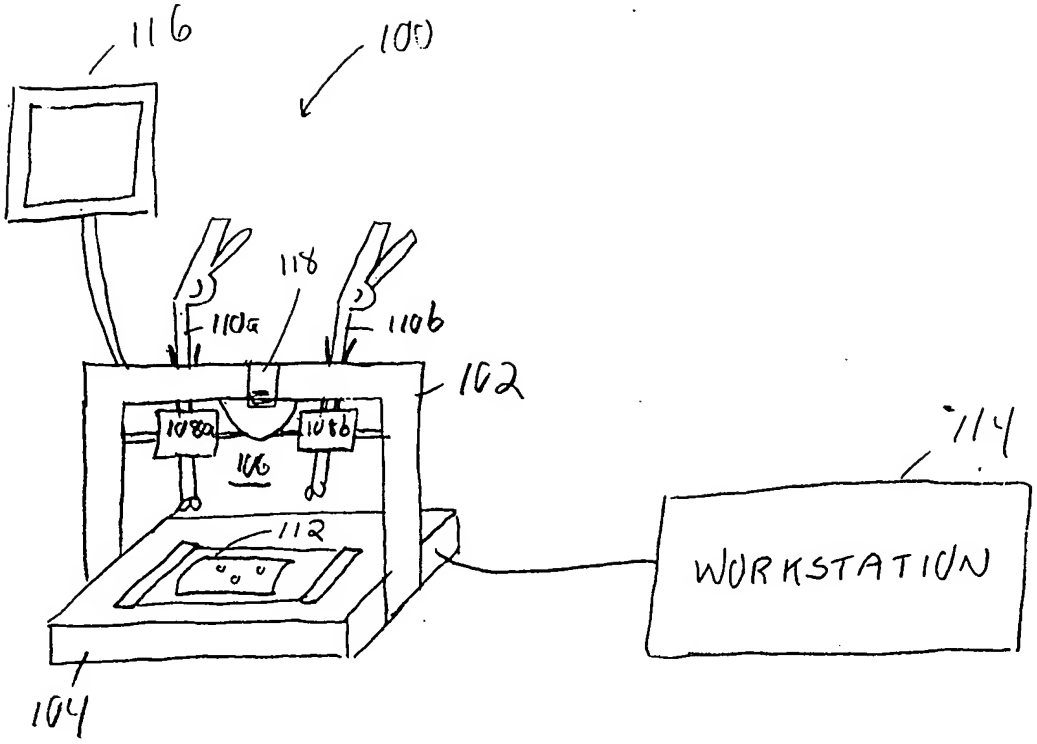
116
100
118
110a
110b
102
108a
108b
106
112
114
WORKSTATION
104

FIG. 1

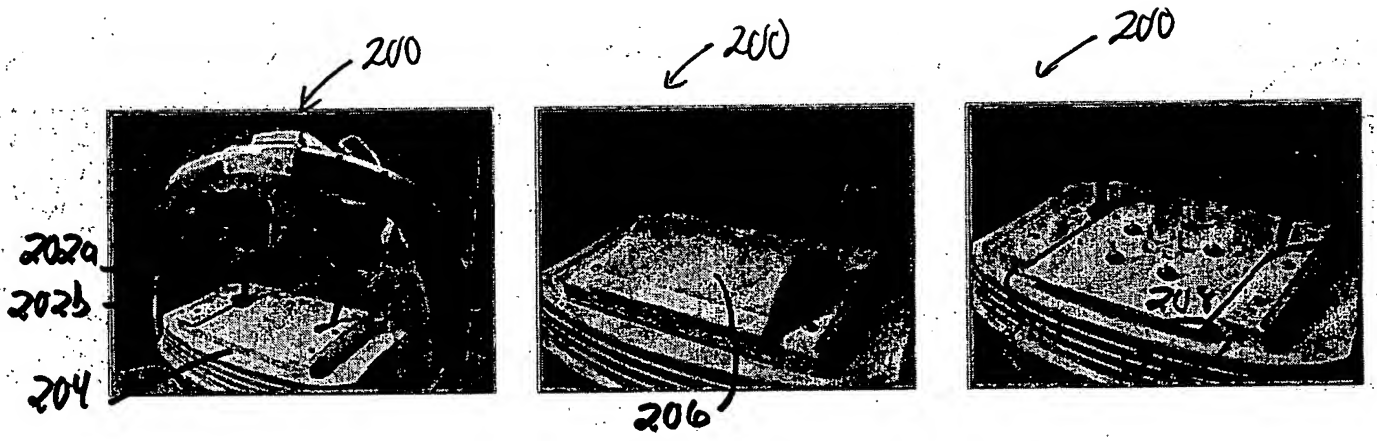

FIG. 2A FIG. 2B FIG. 2C

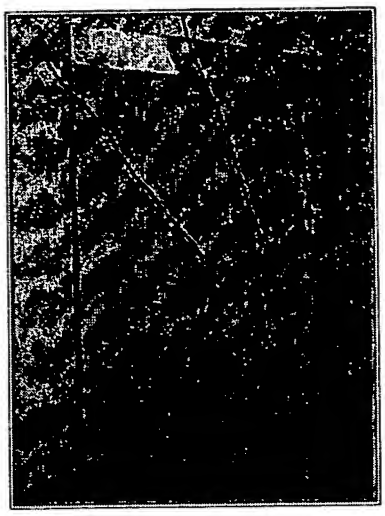

FIG. 3A

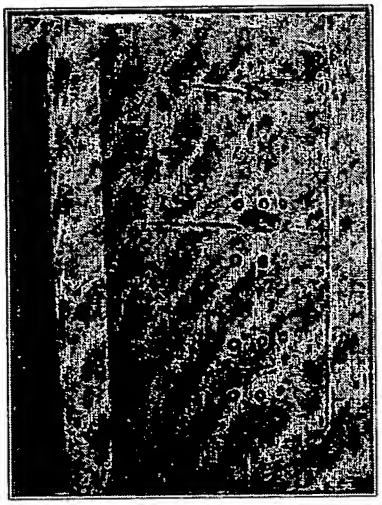

FIG 3B

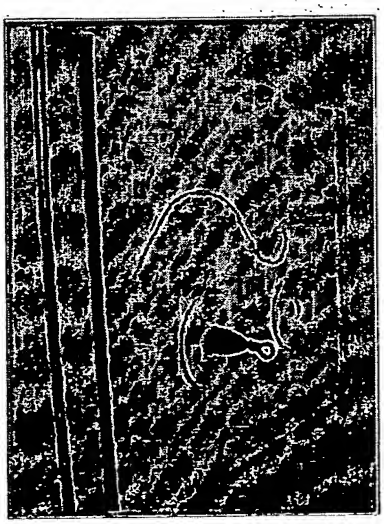

FIG. 3C

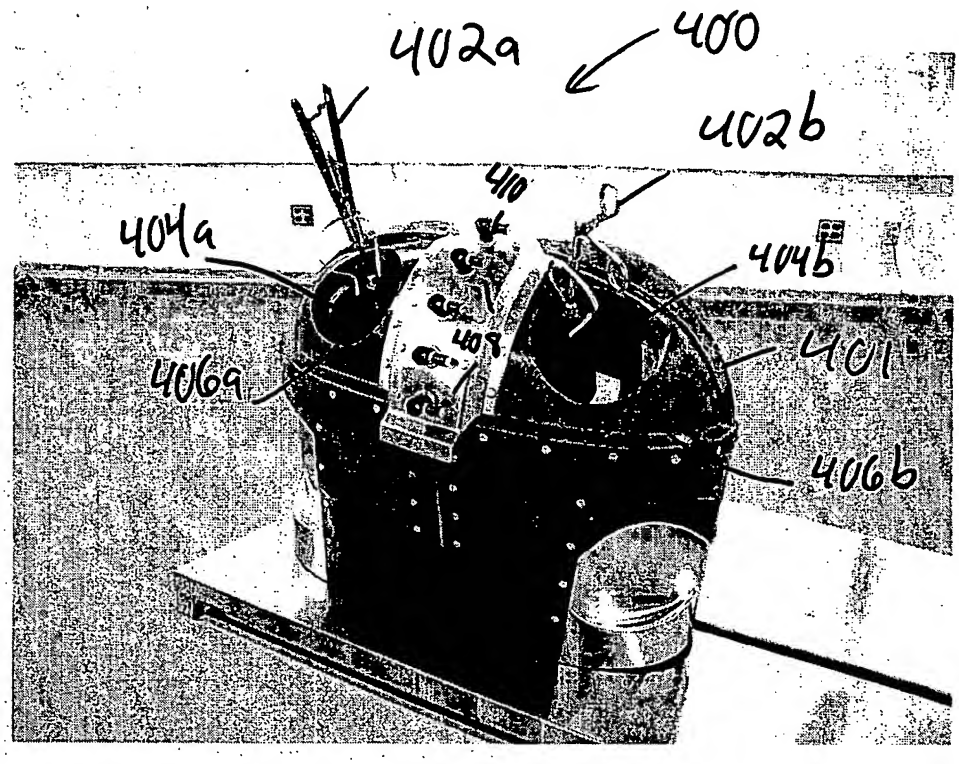

FIG. 4

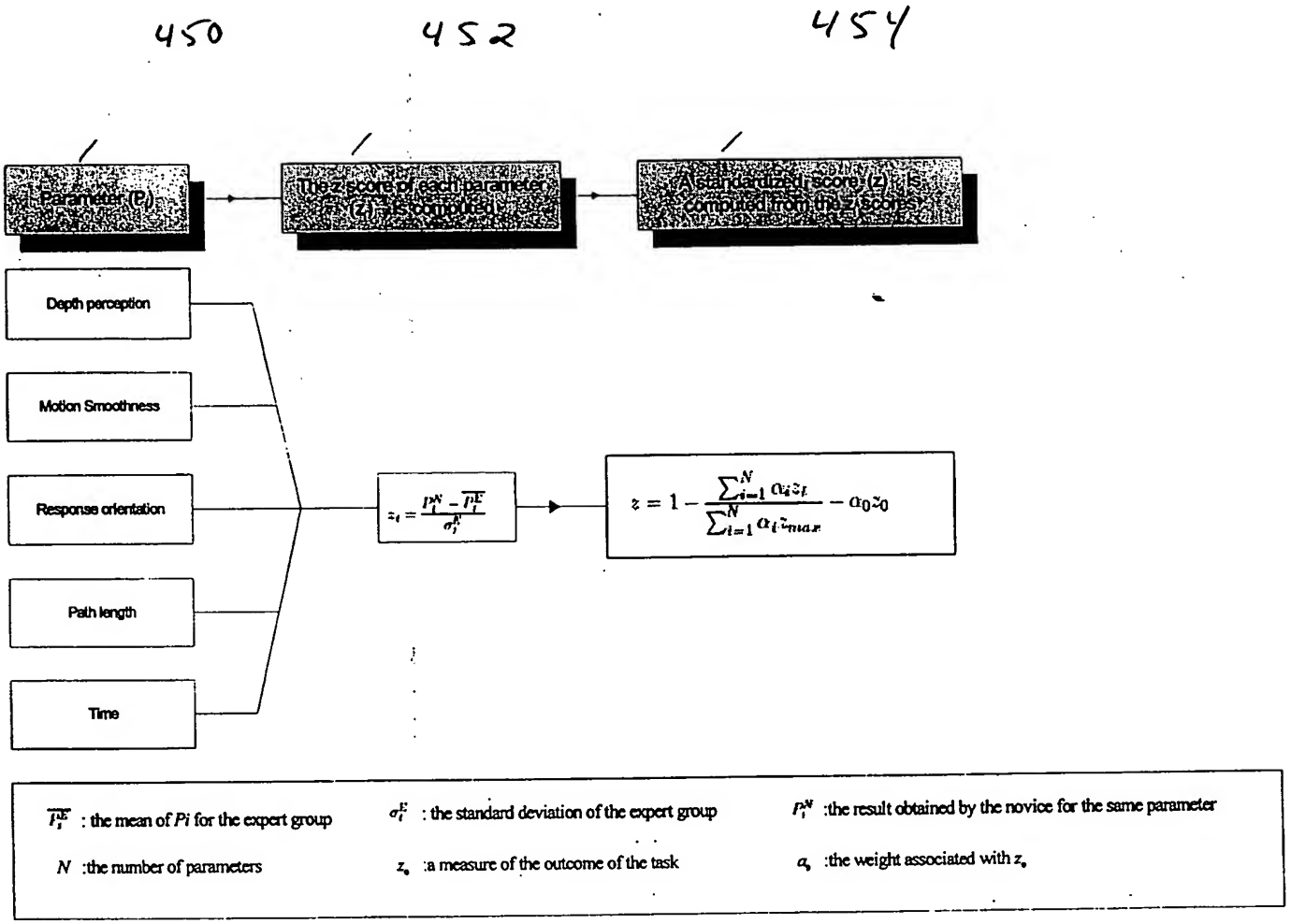
450
452
454
Parameter (Pi)
The z score of each parameter (zi) is computed
A standardized score (z) is computed from the zi scores
Depth perception
Motion Smoothness
Response orientation
Path length
Time
$z_i = \frac{P_i^N - \overline{P_i^E}}{\sigma_i^E}$
$z = 1 - \frac{\sum_{i=1}^{N} \alpha_i z_i}{\sum_{i=1}^{N} \alpha_i z_{max}} - \alpha_0 z_0$
$\overline{P_i^E}$: the mean of Pi for the expert group
σ_i^E : the standard deviation of the expert group
P_i^N :the result obtained by the novice for the same parameter
N :the number of parameters
z_0 :a measure of the outcome of the task
α_0 :the weight associated with z_0

FIG. 5

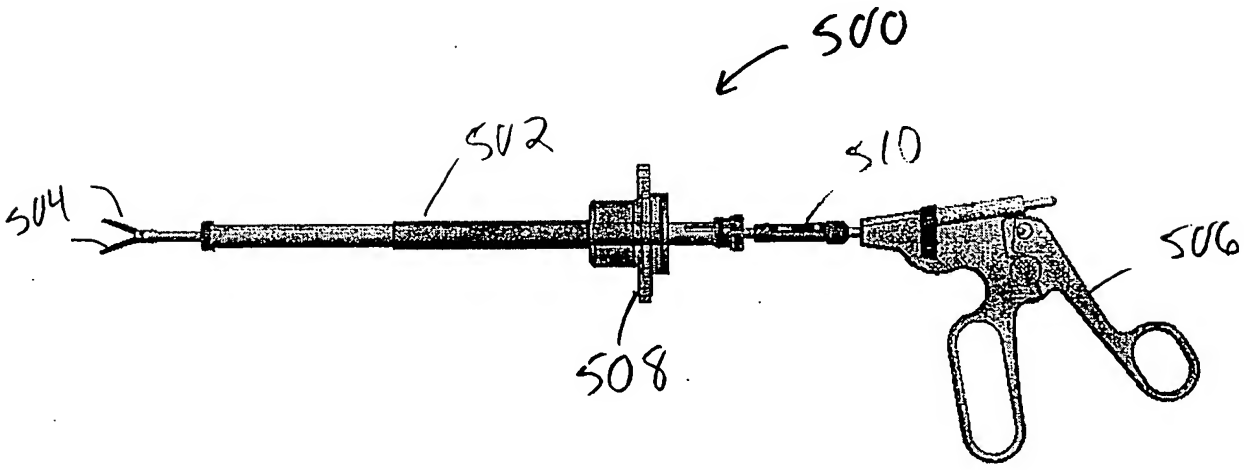

FIG. 6

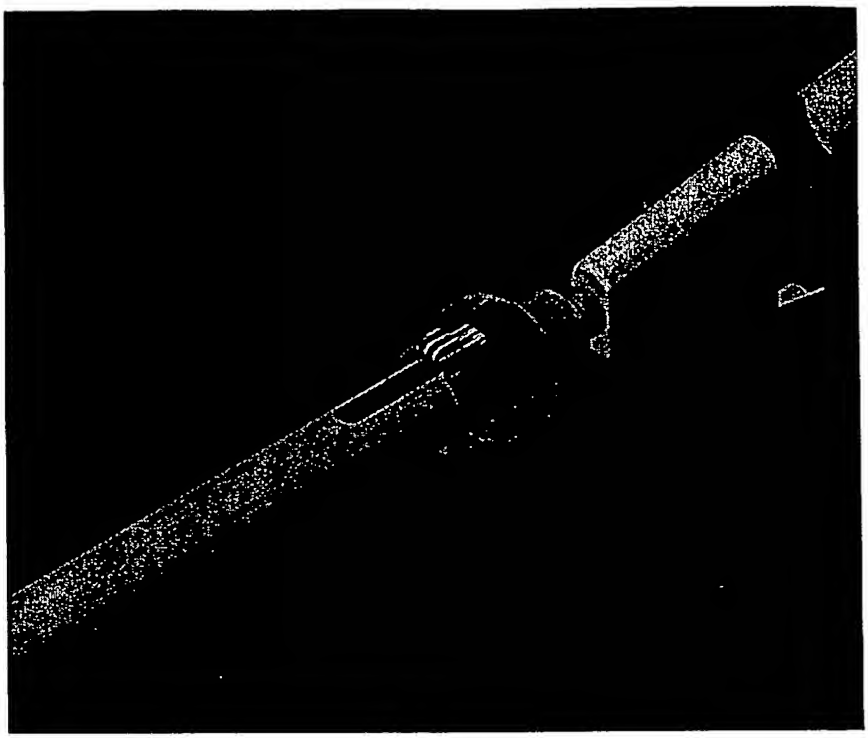

FIG. 6A

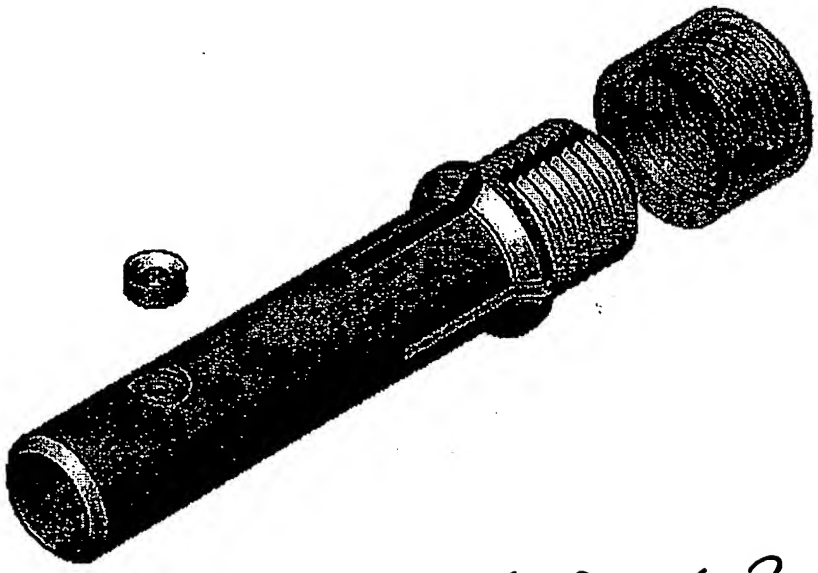

FIG. 6B

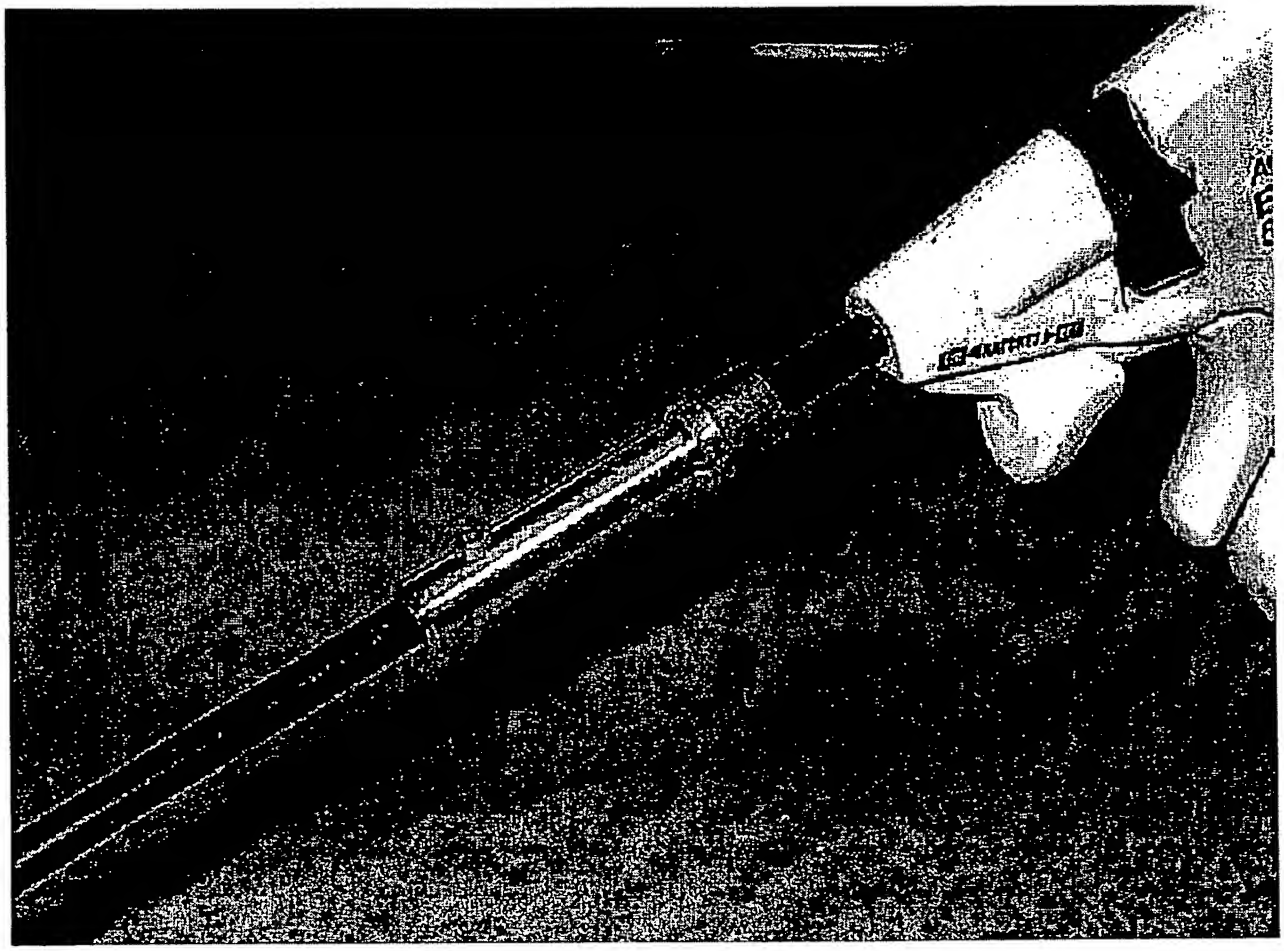

FIG. 6C

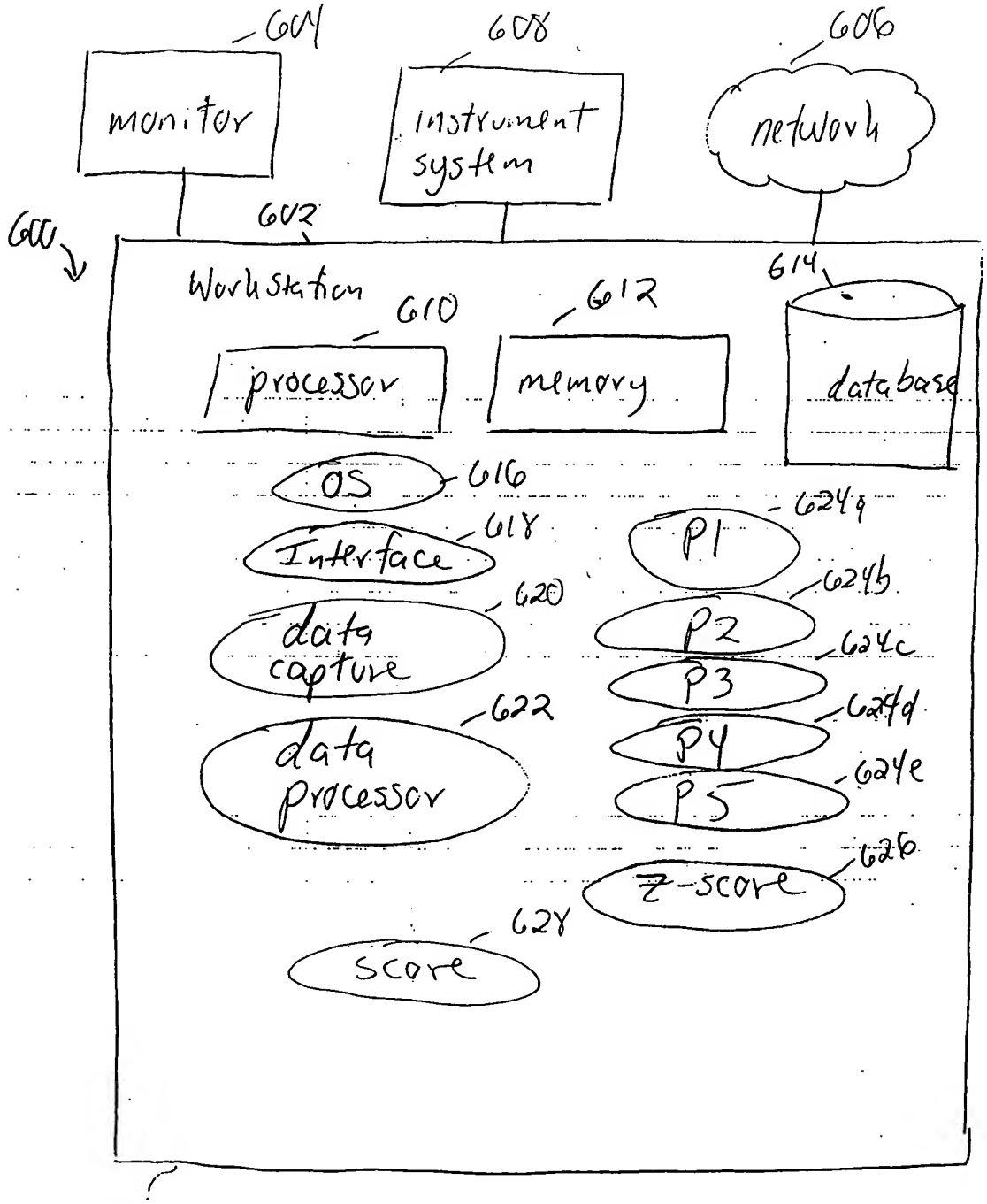
monitor
604
instrument system
608
network
606
600
602
Workstation
processor
610
memory
612
database
614
OS
616
Interface
618
data capture
620
data processor
622
score
628
P1
624a
P2
624b
P3
624c
P4
624d
P5
624e
Z-score
626

FIG. 7

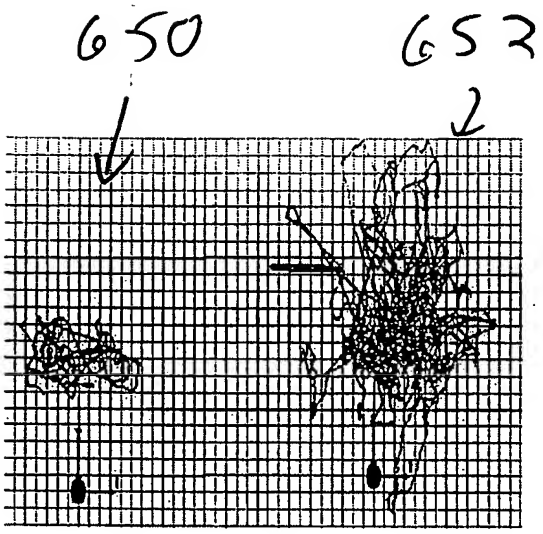

FIG. 8

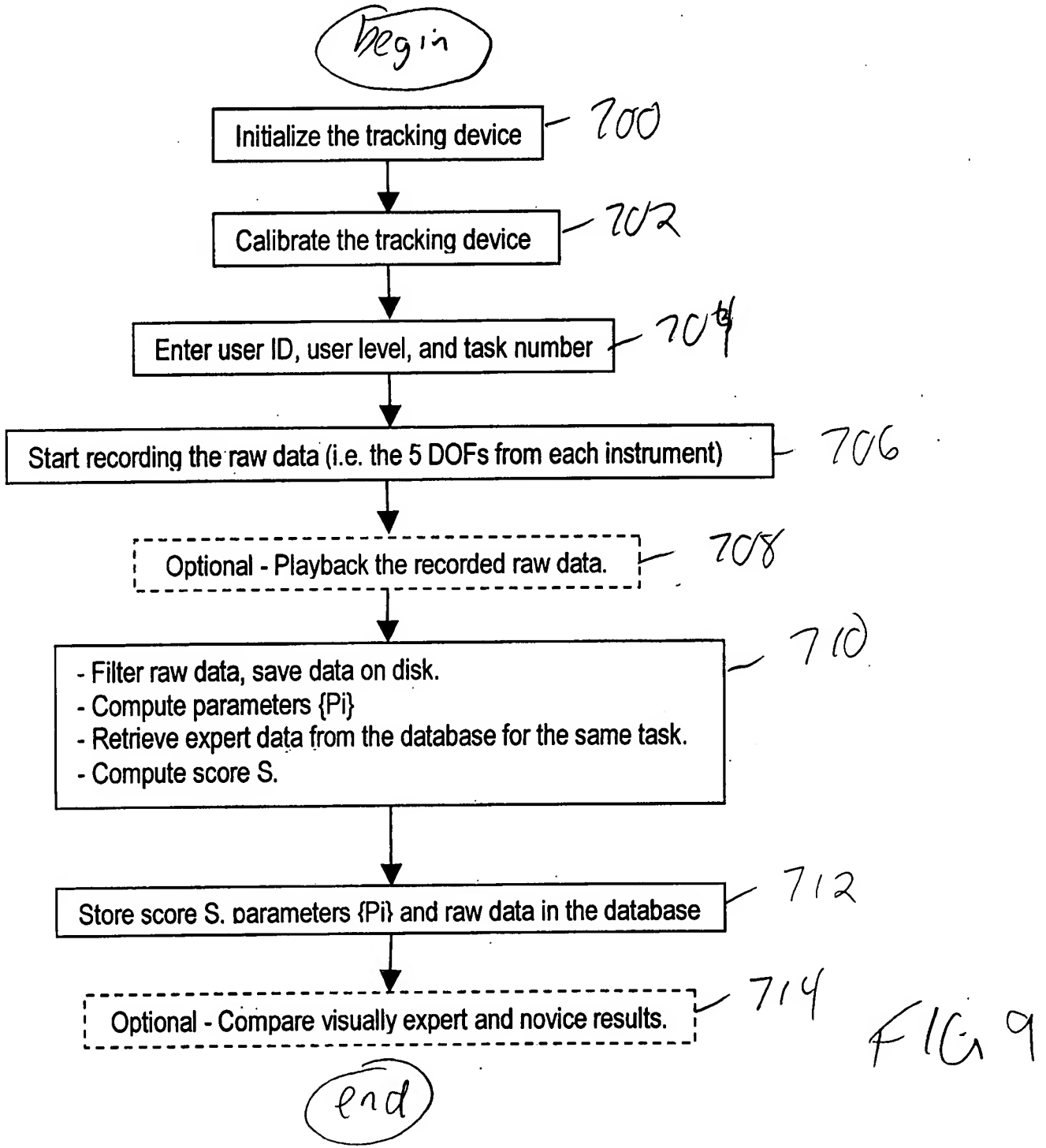
Begin
Initialize the tracking device
700
Calibrate the tracking device
702
Enter user ID, user level, and task number
704
Start recording the raw data (i.e. the 5 DOFs from each instrument)
706
Optional - Playback the recorded raw data.
708
- Filter raw data, save data on disk.
- Compute parameters {Pi}
- Retrieve expert data from the database for the same task.
- Compute score S.
710
Store score S, parameters {Pi} and raw data in the database
712
Optional - Compare visually expert and novice results.
714
End

FIG 9

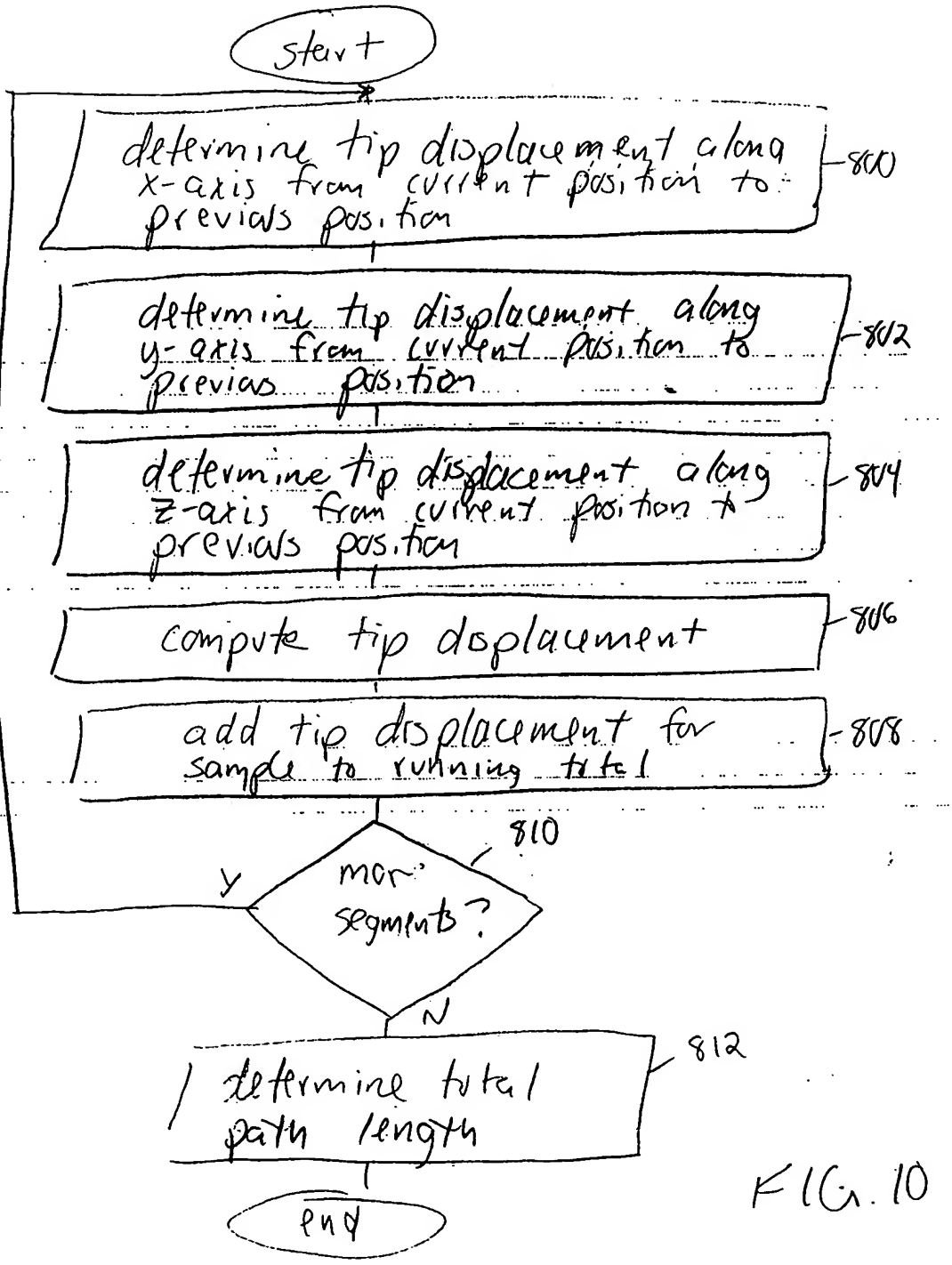
start
determine tip displacement along x-axis from current position to previous position
800
determine tip displacement along y-axis from current position to previous position
802
determine tip displacement along z-axis from current position to previous position
804
compute tip displacement
806
add tip displacement for sample to running total
808
more segments?
810
Y
N
determine total path length
812
end

FIG. 10

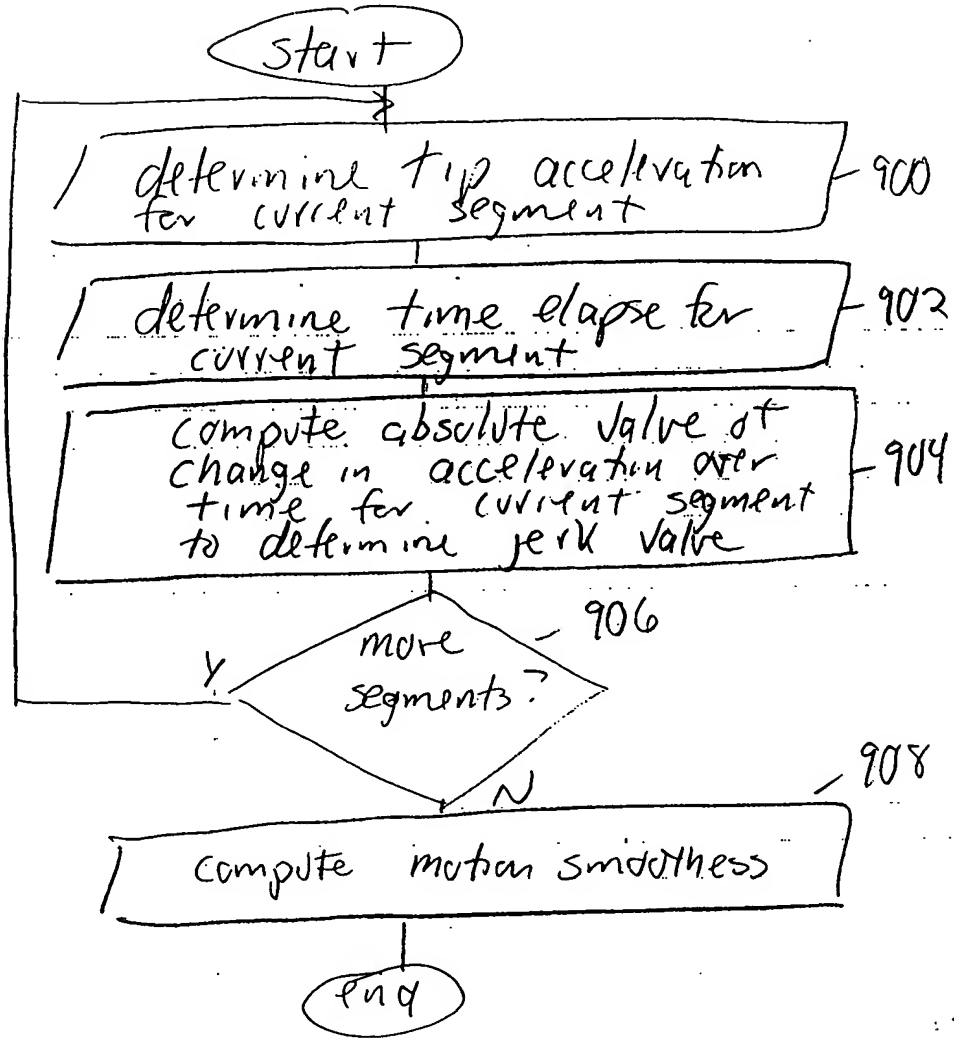

FIG. 11

motion smoothness